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United States. Army war college, Washington, D.C.

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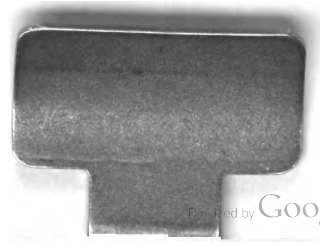

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INSTRUCTIONS ON THE OPERATION OF THE INFORMATION SERVICE AND OF THE TERRESTRIAL OBSERVATION SERVICE OF ARTILLERY

TRANSLATED AND EDITED AT THE
ARMY WAR COLLEGE
AUGUST, 1917

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ONE TO EACH GENERAL STAFF OFFICER
ONE TO EACH OFFICER OF ARTILLERY

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WAR DEPARTMENT,
WASHINGTON, *August 14, 1917.*

The following Instructions on the Operation of the Information Service and of the Terrestrial Observation Service of Artillery are published for the information of all concerned.

[062.1, A. G. O.]

BY ORDER OF THE SECRETARY OF WAR:

H. L. SCOTT,
Major General, Chief of Staff.

OFFICIAL:
H. P. McCAIN,
The Adjutant General.

WAR DEPARTMENT,
THE ADJUTANT GENERAL'S OFFICE,
Washington, June 19, 1917.

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By order of the Secretary of War:

H. P. McCAIN,
The Adjutant General.

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INSTRUCTIONS ON THE OPERATION OF THE INFORMATION SERVICE.

CHAPTER I.

GENERAL REMARKS.

The Artillery Information Service is charged with the following duties:

First. Furnish the commander and the artillery units with all accurate information necessary for the execution of their missions.

Second. Cooperate with all the other information agencies and furnish the commander with the most accurate information of what is known of the enemy's forces, including their offensive and defensive dispositions.

Neither of these two duties should be neglected to the advantage of the other. It is necessary to bear in mind that furnishing the commander with information is as important as the preparation to be made for the execution of his orders.

(1) The exploitation of information with a view to the exact determination of the data necessary to the artillery in executing its mission, is a technical rôle which belongs solely to the Artillery Information Service (A. I. S.).

It is this service which collects, coordinates and sifts all information received from:

(*a*) The observation agencies under the orders of the artillery or which belong to it, viz:

(*i*) Aeronautical service.

(*ii*) Terrestrial observation agencies.

(*iii*) Sound-ranging agencies.

(*b*) The second bureau of the staff or its agent. It determines, with all the accuracy possible, the situation and activity of the enemy's artillery.

It is important that the chief of the A. I. S. should estimate each day the activity of the enemy's artillery, compare it with that of the previous days, and determine the calibers put in action.

Second. Cooperation in procuring information concerning the enemy puts the A. I. S. officer in direct communication with the second bureau of the staff, which is charged, under the direction of

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the Chief of Staff, with the collection and dissemination of this information. The relations between the chief of the A. I. S. and the chief of the second bureau should be close, and conferences should be frequent. The method of visualizing the situation of the enemy artillery, the grouping of the targets to be attacked, and the estimate of their importance, must be personally discussed between the chief of the A. I. S. and the chief of the second bureau. They report a concurring opinion to the Chief of Staff, who submits it to the commander and to the general commanding the artillery. The latter elaborates the propositions of the plan of employment of his artillery.

In addition the chief of the second bureau of the staff gives the chief of the A. I. S. information which supplements that already secured by the agencies of artillery, namely: Information furnished by troops at the front, information gathered by questioning prisoners; and information collected by the aeronautical service which has not been communicated directly to the artillery. During an action, in cases of emergency, the chief of the A. I. S. often receives information directly by telephone from those in action (troops at the front, aviation, etc.), information which, in normal times, he would have received from the second bureau of the staff. He may make temporary use of this, but as soon as possible, he communicates it to the chief of the second bureau, who reviews and interprets it with a view to its use in operation orders. When the observation agencies belonging to the artillery obtain information other than that technically necessary for firing, the A. I. S. communicates it to the second bureau of the staff. The chief of the second bureau, with the chief of the A. I. S., studies the information relating to the artillery which should be put on the topographical documents given to those concerned, and whose execution by special agencies (Topographical Service of the Army, Range Triangulation Battalion) is subject to the orders of the Chief of Staff.

DISTINGUISHING CHARACTERISTICS OF THE ARTILLERY INFORMATION SERVICE OF THE CORPS, AND THE ARTILLERY INFORMATION SERVICE OF THE ARMY.

An artillery information service is provided for each of the artillery commanders of large units (corps and army). The mission of the A. I. S. of the corps is distinct from that of the army. The army and the corps play two different rôles in the directing of terrestrial observation; furthermore they do not use the *information relating to the artillery objectives* in the same way.

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First. The terrestrial observation information service assigned to the artillery is organized according to the nature of the terrain, and not according to the temporary arrangement of the corps or infantry division at the front. It is a territorial organization which belongs to the army. To insure the continuous and satisfactory working of the service, it is necessary to have a permanent personnel. Actual conditions of prolonged fighting require the continual renewing of units (corps or divisions), and the only permanent element in a given sector is the army. The observation personnel should therefore belong to the army.

On the other hand, in order to obtain the most effective use of the observation agencies thus established, it is absolutely necessary that they be placed at the entire disposal of the large units, corps or divisions, assigned to the sector in a position to exploit the information received.

The Artillery Information Service of the army should have charge of all the organizations which secure information by terrestrial observation along the front of the army, as well as the maintenance of the agencies whose duty it is to insure this service; but they should be assigned for duty with the corps concerned. The artillery observation sections, the information sections of terrestrial observation and the sound-ranging sections, even though considered as agencies belonging to the artillery of the army, should be placed under the orders of the artillery of the corps.

Second. The gathering of exact information concerning artillery targets, and its communication to the staff and to the units, is accomplished in the corps in a different manner than in the army.

The A. I. S. of the corps receives, usually with little delay, all the information gathered by the corps observation agencies. The analysis and condensation should be accomplished in a short time, and the results transmitted without delay through the corps to those concerned. This relative rapidity in the operations of the A. I. S. is absolutely necessary to the units of the corps, in order to enable them to make use of this information without loss of time. But it should be remembered that under these conditions certain information is furnished subject to confirmation later. The A. I. S. of the army corps is unable to furnish complete and exact data relating to the objectives, especially concerning their exact position, which can only be given by the A. I. S. of the army from information based on the operations of the survey detachments of the large-scale artillery maps.

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Thus the rôle of the A. I. S. of the army corps is to gather together acquired information and to make a preliminary study and analysis of it with all possible care. But the communication of this information to the artillery must not be delayed so long as to prevent its being used in time to be effective.

The A. I. S. of the army has a different duty. It has no direct connection with the information agencies of the corps, and it is, moreover, too far from those who are to make use of the information sent out. Its intervention is only for the purpose of revising, condensing, and harmonizing the work of the A. I. S. of the corps. It utilizes their work directly, and it is able to check up the information only by comparing it with and by using new information obtained from the army, the second bureau, the aeronautical service, and survey detachment. The A. I. S. of the army thus definitely coordinates all information relating to artillery targets for the entire front of the army, basing its work on the operations of the A. I. S. of the corps. It makes periodical recapitulations, which serve as a basis for operations of the A. I. S. of the corps.

PERSONNEL OF THE ARTILLERY INFORMATION SERVICE.

The chiefs of the A. I. S. should be very experienced officers, thoroughly familiar with the use of artillery. The commander will intrust to them the study of all questions relating to observations of artillery of the army, or of the corps. He will take care to avoid restricting their rôle to the mere receiving of information, in order to cause them to participate as far as possible in the search for information. In addition, he confers with them in deciding upon the use to be made of information gained; that is to say, upon the general activity of the artillery, in such a manner as to stimulate their zeal and give to their work all the interest which properly belongs to activities which are alive and vigorous.

CHAPTER II.

ARTILLERY INFORMATION SERVICE IN A CORPS.

The duties of the Artillery Information Service in the corps are:

The direction of terrestrial observation service for the artillery commander in the sector of the corps.

The collection of all information on artillery targets, with a view to its use in fire, the study of it, and its general distribution after being verified and coordinated.

The A. I. S. also assists the staff of the artillery commander in keeping the special reports relating to the organization of fire in the sector.

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Personnel—Matériel.—In each artillery staff of a corps, the office of A. I. S. is filled by a captain, preferably one who has commanded a battery, or by a lieutenant fulfilling the same requirements. He must be especially qualified to direct the service of terrestrial observation, and must also be perfectly familiar with aerial observation work. A lieutenant or a second lieutenant is his assistant. A sergeant and two clerks are assigned to him. He uses the matériel indicated in Appendix I.

INSTRUCTIONS FOR ARTILLERY TERRESTRIAL OBSERVATION SERVICES.

SECURING INFORMATION BY TERRESTRIAL OBSERVATION.

The A. I. S. directs, in its sector, the terrestrial observation service organized by the army at the front, in order to provide general supervision of the battle field and to find and locate artillery targets. (See instructions on liaison.)

This service, which operates in conformity with the general plan for observation prepared by the army is intrusted to the terrestrial observation sections, which are therefore attached to the corps.

(When the operations of one section concern the two adjoining corps, an army order prescribes the exact conditions under which the two A. I. S. concerned may utilize it.) The chief of the A. I. S. controls these sections in everything pertaining to their employment. (The A. I. S. is not directly concerned with the technical operation of these sections. Its duty is always to forward to the army any observations bearing on the results obtained.) The chief of the A. I. S. defines the mission in accordance with the orders given by the A. I. S. of the army. He fixes the zones to be especially observed. He uses them whenever it is necessary to make special observations and obtain additional precise information on certain targets which might be useful in verifying other information obtained from other sources.

If the terrestrial observation service is not yet established along the front of the corps, the A. I. S. organizes it with a personnel of observers selected from the units. The matériel necessary for this service is issued to the A. I. S. In this case, the A. I. S. may use, as observation stations, the observation station of the commanders of the artillery division of the corps and the heavy artillery of the corps. These steps can be taken only if the command observation stations are so located as to offer good views of the enemy lines. The service must be maintained by a detachment of permanent observers under the direct control of the A. I. S. (One officer and six or eight

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observers for each station, selected from the artillery division, the army corps, and the heavy artillery.)

(*b*) *Ranging by sound.*—Sections for ranging by sound in the sector of the army corps are placed under the direction of the A. I. S., as are the terrestrial observation services, and under similar conditions.

(*c*) *Observation of adjustment and of fire.*—The A. I. S. has no direct control over the observation station of the units. But it is the duty of the artillery commander to establish liaisons in order that the A. I. S. may obtain the greatest possible results from these observation stations. In return the A. I. S., under the orders of the staff, studies and directs the operations of the observation sections of the artillery (terrestrial and sound) so that they will bear on the adjustment and control of fire, whenever they can be advantageously employed.

Finally, whenever there exists on the front of the corps a system of observation stations and centrals forming part of a general system of fire control established to enable all the batteries of a sector and the adjoining sectors to profit by the observations of the same observation stations, the artillery commander assigns the operation of this special service to his A. I. S.

COLLECTION, COORDINATION, AND DISTRIBUTION OF INFORMATION.

Second. The principle duty of the artillery information service is to receive, collate, and distribute, after verification and coordination, all the information concerning the artillery targets.

COLLECTION OF INFORMATION.

The A. I. S. receives information from the aeronautical service and the second bureau. It also has the information obtained by its own terrestrial observations:

(*a*) *Aeronautical service.*—The aeronautical information is obtained from reconnaissances and photographs which are sent out by the aeronautical information officer in the form of reports of information, photographs, and identification cards of enemy batteries, which are sent immediately, or at the end of the day, to the artillery.

When the importance of the reconnaissance justifies it, the officer who made the reconnaissance is sent to the artillery to furnish additional explanations. (See "Instructions on the search and study of information.")

During periods of little activity and in a corps having only its normal heavy artillery, the A. I. S. has no difficulty in keeping

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up with the results of aerial reconnaissances (by the wireless of the command, direct telephone to the balloons, and examination of aerial photographs) and in discussing this information with the aeronautical observers or officers.

In periods of great activity and when the aeronautical service is reinforced, the receiving and classification of aeronautical information becomes more difficult for the A. I. S.

It is necessary that the artillery commander take special steps to insure the delivery of all information concerning the A. I. S. in time to be of use, and that the A. I. S. be given every facility it needs to discuss the information with the aeronautical information officers, or with the observers themselves. The steps to be taken for this depend upon the general organization of the artillery and of the aeronautical service of the sector. In any case it is necessary that the aeronautical information officer have a daily conference with the chief of the A. I. S. in order to study and discuss with him the summary of information gathered by the aeronautical service during the preceding 24 hours.

(*b*) *Second bureau of the staff of the army corps.*—The information gathered by the second bureau in regard to the artillery targets should be transmitted to the A. I. S. either by daily bulletins of the second bureau or, in urgent cases, by special notices or cards, or by verbal communications from the chief of the second bureau or his representative. This information, relating to organizations of the enemy, cantonments, shelters, railroads, much used trails, batteries, munition depots, observation stations, etc., is secured from the interrogation of prisoners; from the reports and sketches furnished by the infantry information officers, supervised, verified, and circulated by the corps topographical section; from listening posts; and from information and documents captured on the enemy, or obtained by special means. A close liaison should exist between the second bureau and the A. I. S. The A. I. S. should especially keep in constant touch with the corps topographical section, which communicates to it the results obtained from the photographs, and distributes to it the corrections of the battle map, showing the enemy's new organizations and the exact configuration of the front.

(*c*) *Terrestrial observation service.*—The information obtained by this service and by the sound-locating service is sent to the chief of the A. I. S. by the chiefs of the former sections, either by telephone or by daily bulletins. The information obtained by other observation stations established in the sector by the batteries, battalions, or staffs is sent to the A. I. S., according to the artillery commander's orders.

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The duties of the chief of the A. I. S. do not end with simply receiving the information obtained from the above-named information agencies. He must also direct their activity and aid them as much as possible. For this purpose he communicates to the various observers the results obtained by all of them, in order that they may be able to check up their observations. He informs them of the missing links and inaccuracies which seem to exist in the information relating to certain targets, in order to cause them to make additional observations or reconnaissances. The chief of staff of the corps defines the conditions under which the bureaus and the above-mentioned services are coordinated with the work of the A. I. S. by the staff of the corps.

REGISTER AND MAP OF BATTERIES.

The A. I. S. notes and classifies as quickly as received all information concerning each enemy battery (kind, activity, successive changes, exact positions, etc.). This information should be kept in a register or on index cards, so arranged as to show the latest résumé of information in regard to each battery. A map, kept strictly up to date, should be made a part of this register. It should be revised periodically. The consecutive maps are preserved to aid in following the successive changes in the position of the enemy's artillery. In case of relief, all documents should be turned over to the corps concerned.

COORDINATION OF INFORMATION.

The study and coordination of information concerning the artillery targets is the most delicate part of the duty of the A. I. S. In order to eliminate doubtful elements, the commander of the A. I. S. should very methodically and patiently separate them and give to each the consideration it deserves. It is impossible to give exact instructions on the study, since it may take various forms, according to circumstances. In a general way, consideration should be given to the remarks relating to the value of information as given in Appendix II.

In the study and determination of the position of the enemy's batteries the observer should not be misled and should give special attention to the causes of error due to the camouflage of the true batteries and the simulated activities of the sham batteries (flashes, the condition of approaches, etc.) As a general rule, the sham batteries are located near the true batteries, and frequently in emplacements previously occupied and evacuated on account of

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the very effective fire of our artillery. The balloons and the terrestrial observing stations will help remove all doubts on this subject by the agreement or disagreement observed between the apparent fire of the round and actual arrival of the projectile. Sound location will furnish minute verification as to the occupation of the positions.

As a rule, when the enemy's artillery has been reinforced or its position modified for any reason, the first reports from the artillery information agencies are numerous, but without complete agreement, so that the number of batteries seems high. The A. I. S. should eliminate the improbabilities shown by verifying the positions determined by the observers or different agencies of information.

As the study of information relating to the artillery targets demands considerable time, the A. I. S. should be allowed sufficient time to devote to it.

COMMUNICATION OF INFORMATION.

INFORMATION BULLETINS.

By the aid of a daily bulletin, the A. I. S. communicates to the subordinate artillery commands, down to the battery commanders, and to the units, all exact information it has been able to obtain relating to the targets. This bulletin is sent to the second and third bureaus of the army corps, to the A. I. S. of the adjoining corps, and to the army in three copies (Artillery, Aeronautic, and Range Triangulation). The bulletin covers a period of 24 hours, which is fixed by the army. For example, for the period from 6 a. m. to 6 p. m. The work of the A. I. S. is done during the night and following morning. The bulletin is finished and sent out before noon. It should present, in a clear and concise form, all information affecting the artillery in the slightest degree, or which is useful in bringing to its knowledge the means of fulfilling its mission under the best possible conditions. This information should be classified as follows:

(*a*) *Activity and situation of the enemy's artillery.*—It is necessary to show, besides the batteries that have been in action during the last period of 24 hours, the newly discovered sites, occupied or not, and the batteries already located but whose positions have been changed. For the designation of the batteries, the bulletin uses the coordinates of the battle map. The list is prepared in a form similar to that given in Appendix III. When new batteries are found, the A. I. S. gives them numbers corresponding to their pre-

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sumed positions. If necessary, these numbers may be modified later by the army, according to further information, but they should not be changed from the moment they have been put on the battle map.

(*b*) *Results of our own artillery fire.*—The results of destruction fire on enemy's works and destructive fire on batteries are noted with minute details reported during fire for adjustment and fire for effect.

(*c*) *Organization of the enemy, his general activity.*—Most of the information concerning the enemy's organization—enemy batteries excepted—of special interest to the artillery will be found in the information bulletin of the second bureau of the army corps, or on the corrected plans, or special sketches of its topographical section. The bulletin of the A. I. S. publishes them in extracts or note form. If necessary, the remarks give details of certain parts of the enemy's works to be demolished, and indicate the photographs that should be consulted.

Certain distant artillery targets, however, such as cross roads, tracks, munition depots, supply stores, observation station, C. P., etc., may cause the A. I. S. to make a special study of (photographs, diagrams, information from the second bureau, etc.). The results of this study should be published in the daily bulletin, under the form, whenever possible, of sketches with explanatory notes.

The A. I. S. bulletin is published and distributed under the stamp of the artillery. It is checked by the second bureau in everything that concerns information other than that relating to the enemy's batteries.

With the exception of the documents coming from the Army (A. I. S. of the army and range triangulation), no documents similar to the bulletin will be distributed to the batteries of the corps, and no lists or maps of batteries will be distributed unless they have been verified, checked, and approved by the A. I. S. of the corps.

REMARKS ON THE WORK OF THE A. I. S. IN THE IMMEDIATE TRANSMISSION OF INFORMATION.

The immediate transmission and utilization of information concerning artillery targets is assured by the decentralization of the different agencies of information (aircraft, balloons, observation sections of artillery, their centrals, and isolated observation stations) put at the partial disposition of the battalions or directly connected with them under the conditions defined by the artillery commander of the army corps.

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The A. I. S. should keep itself informed of all information transmitted directly to the various subordinate units. It should send information directly to the artillery commander, in order that he may make the most of his opportunities and insure complete utilization of information relating to important targets.

The A. I. S. also insures and controls the rapid transmission of information to the authorities concerned, when this information comes from adjoining corps or the second bureau and when it is such as to justify immediate fire. The A. I. S. immediately transmits to the Second Bureau of the corps, to the A. I. S. of adjoining corps and to the groups of the heavy artillery of the army, all the important information of interest to them unless it is certain that they have already received it.

To conclude, from the point of view of the immediate transmission of information, the A. I. S. has either the mission of checking information for the staff or the mission of liaison in delivering information to different units which have to use it.

These duties require a great deal of initiative and activity on the part of the commander of the A. I. S., as well as a perfect knowledge of the organization of the artillery of the sector, of the mission of the different battalions and larger units, and of their possibilities of fire.

RÔLE OF THE A. I. S. IN THE ORGANIZATION OF FIRE.

Third. At artillery headquarters the A. I. S. helps in the establishment and maintenance of fire files of the artillery of the sector. Identical files are kept for each auxiliary position. The files should contain—

(*a*) The diagram showing the organized groups, with the zones of action of the different units, the location of the command posts, aerials and balloons, and the complete system of liaison between the different units.

(*b*) The general plan of the entire system of terrestial observation, including the observation stations, the liaisons between the observation agencies, and the liaisons between the observation agencies and the units and the general staffs. Also the list of coordinates of the observation stations, with maps and sketches showing the views from them and indicating their use, and the orders concerning them.

The commander of the A. I. S. keeps the files of terrestial observations with special care, in order to inform each unit coming into the sector in regard to its possible observation stations. Consequently, he should know thoroughly which parts of the enemy zones can be seen, and to which points it is necessary to go in order to secure the

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most favorable conditions for adjustment and control of fire. The A. I. S. also gives the units the necessary documents relating to the organization of fire. It compiles and distributes to the batteries extracts of lists of the geodetic points established by the range triangulation battalion. It informs the topographical section of the corps as to the number of battle maps and the corrected plans necessary for the artillery. If the occasion demands it, it distributes these maps and plans, and in any case it sees that all the units and general staffs of the artillery are well supplied with them. Finally, it does whatever is necessary to enable the subordinate units to receive the photographs that are absolutely necessary for the study of their targets, the preparation of the fire, or the verification of the results.

Chapter III.

ARTILLERY INTELLIGENCE SERVICE OF THE ARMY.

THE A. I. S. OF THE ARMY IS CHARGED WITH—

Studies concerning the organization of terrestrial observation service relative to the artillery of the army, as follows:

(*a*) Terrestrial observation service.

(*b*) Locating by sound.

(*c*) The general system of control for the coordination of the work of the artillery of the army.

The studies and work concerning the operation of the A. I. S. of the army itself.

The commander of the A. I. S. of the army controls the work of the A. I. S. of the corps. He coordinates them. He facilitates the necessary liaisons between the various A. I. S., assures and superintends the transmission to reliefs or new corps of the information and orders relative to the work. He also establishes liaisons with the A. I. S. of adjoining armies. He takes part in the study of questions of organization of fire referred to the staff of the artillery commander of the army. He directs the artillery observation sections (terrestrial and sound) as far as the definition of their mission and their general use is concerned. The technical control of these sections is exercised by the commander of the range triangulation group, according to instructions from the general director of the army geographical service. This general officer, technical director of terrestrial observation and locating by sound-sections of the armies, is charged with the direct supervision of their technical work and with making all useful proposals concerning it.

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The commander of the A. I. S. studies the question of the work of the sections during an active period, during an advance, and during combat in the open. He issues instructions necessary to prepare the personnel for the discharge of the duties which may be assigned to them during action, especially practical instructions in map reading, terrain reconnaissance at a distance, and visual signaling.

All questions concerning the personnel of the sections are referred to him.

In each army artillery staff the A. I. S. is assigned to a major or senior captain, showing aptitude in directing this service. A captain or a lieutenant, with two clerks, are attached.

PART PLAYED BY THE A. I. S. IN THE ORGANIZATION OF GENERAL OBSERVATION SERVICE.

(*a*) *Organization of terrestrial observation service.*—The principles of the organization of the terrestrial observation service at the army front have been indicated above.

The system of observation comprises a series of observation stations selected for their view of the enemy zone, and central stations to direct observations and utilize information received. Adjoining observing stations are connected with each other, and all stations in a group are connected with the central station. (See Part II, Instructions for terrestrial observation sections.)

The service is performed by the personnel of the observation sections, divided for this purpose among the various sectors, and put under the orders of the A. I. S. of the corps. The commander of the army A. I. S. undertakes the arrangement and coordination of the system of observation stations and centrals to be established. The aim is to keep a continuous and close watch on the entire enemy zone within which targets may be revealed, to insure the direction of observations under the most satisfactory condition, and, above all, to utilize the information received. But it is essential that this result be obtained by the simple arrangement of a few observation stations, and without necessitating an excessive network of telephone wires.

The commander of the army A. I. S. makes all the terrain reconnaissances necessary for the execution of his mission. He is assisted, if necessary, by the commanders of the A. I. S. of the corps, and by the commanders of observation sections. He takes the advice of the range triangulation group in regard to choosing the most advantageous observation stations, and the advice of the commander of the first line telegraphic service in regard to establishing and maintaining liaisons. The plan of the terrestrial observation service,

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drawn up by the commanding general of the army artillery, is based on a project submitted by the commander of the A. I. S. This plan shows by maps, diagrams, and explanatory appendixes:

First. The position and range of vision of the observation stations.

Second. The special wires connecting observation stations and centrals with their directing A. I. S., as well as with the C. P.'s, various staffs, and auxiliary observation stations with which they may eventually be connected.

Third. The subdivision of the terrestrial observation service at the front, showing the stations and centrals to be occupied by them, and their connection with the various corps (A. I. S.), as well as their means of intercommunication.

Fourth. The missions and general instructions given to the commanders of the observation sections and the commanders of the A. I. S. in regard to the coordination and cooperation of the service. *These instructions must specify in detail under what conditions the terrestrial observation service shall be used in adjustment and control of fire.*

(*b*) *Locating by sound.*—The commander of the A. I. S. makes a study of locating by sound along the front of the army. He fixes the position of the sections, giving due consideration to the technical exigencies of the process, and the directions furnished him by the commander of the range triangulation group.

As a general rule, locating by sound will be resorted to only in sectors where other methods of investigation are restricted (a wooded enemy zone, where terrestrial observation is difficult). Locating by sound is not generally satisfactory, excepting on that part of the front where the artillery of both sides is relatively inactive. Its most important services will be rendered during the period preparatory to the offensive, in locating batteries actually occupied, masked batteries, flanking guns covered by a village or wood, long-range guns masked from view, etc.

The propositions to be submitted by the commander of the A. I. S. to the commander of the artillery of the army relative to the assignment of sound-locating sections to the corps are similar to those relative to the terrestrial observation service. They must specify in detail what use the artillery of the corps may make of the sections assigned to it for the purpose of fire adjustment.

(*c*) *Adjustment observation of fire.*—When the commander decides to organize a general system of range finding along the front of the army, the commander of the army artillery intrusts the study of this organization to the commander of the A. I. S.

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This system may control guns of all calibers, and be laid out independently of the existing lines. If this organization should entail laying telephone wires in excess of the looked-for results, the existing system should be utilized, modified, and enlarged to the extent necessary in order that the greatest possible number of batteries may be directed by the principal observation stations. The commander of the A. I. S. consults with the commander of the first line telegraphic service on the subject of improving the old system, or laying a new one. Their plans are reviewed by the general in command of the artillery, and this results in the establishment of a plan similar to that for observation and information.

The observation stations and range-finding centrals are served by the personnel of the units. Nevertheless, in order to facilitate relief, it is well to assign permanently a certain proportion of the necessary observers (officers and men) selected from those artillery units which remain with the army (heavy batteries manned by garrison artillery).

As a rule, the observation stations for adjustment of fire are distinct from information observation stations. However, if the latter are particularly well adapted either for fire adjustment or for observation centrals, that use should be made of them. In this case an auxiliary observation station should be constructed alongside of the information observation station, and placed under the supervision of the station commander, but the liaisons of the former observation station must supplement the usual system of liaison for information.

DUTIES OF THE A. I. S. OF THE ARMY AS AN INFORMATION AGENCY.

2d. The A. I. S. of the army should inform the commander as to the situation of the enemy's artillery in front of the army, as to the importance and caliber of its principal groups of batteries, as to their activity, and as to their successive alterations or changes. It should furnish the subordinate units with exact information regarding the position of the enemy's batteries. For this purpose, the daily information bulletins of the A. I. S. of the corps must be sent to army artillery headquarters. There they must be coordinated and completed by information obtained direct from the army. Finally, in conjunction with the range triangulation group, army artillery headquarters fixes the position and map coordinates of the batteries located.

The commander receives the information which concerns him, and the army corps receive the result of the coordination of the A. I. S. under the following conditions:

Documents to be established: Map and List of Enemy Batteries; Communication to those concerned.

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The A. I. S. of the Army keeps an up-to-date map and general list of the enemy batteries. Extracts from this list are published periodically and distributed to the army corps. Additional information is sent to them when necessary.

The map of the enemy batteries is put on the battle map of a scale of $\frac{1}{20000}$, in order to bring out the daily situation of the existing batteries on the front of the Army, their degrees of activity, their calibers, and (if possible) their targets. By making the necessary corrections, this map may be used during a long period—10 or 15 days.

The range triangulation group notes the batteries that are marked on the map as having been active during the last period, in order that they may be put on the new editions of the battle map. Extracts from the battery maps may also be made and distributed periodically to the units, with a diagram indicating the usual targets of the enemy batteries.

The map of enemy batteries is primarily for use of the Artillery Commander of the Army.

The commander of the A. I. S. sends it to him and gives him all necessary data to enable him to grasp the changes that have resulted, or that may be expected, in the disposition of the enemy's artillery. He points out to the Artillery Commander those batteries which have been the most active and those which have been spotted in action only once.[1] He also shows him the results obtained by the artillery of the army corps (or by the heavy artillery of the army) in its distinctive fire, by means of incessive photographs of the positions fired on.

The general list of enemy batteries, kept by the A. I. S. of the Army, is an inventory of all the existing enemy batteries and emplacements on the army front. It is added to the battle map of scale of $\frac{1}{20000}$. The batteries are catalogued under their hectometrical numbers.

Notation will be made after each battery of the date of its discovery, the source of information, the days of its activity, its target, the destructive fire it has been subjected to, the number of aerial photographs which indicate its situation, etc.

Extracts from the general list of the enemy's batteries are compiled and published periodically in form similar to the bulletins of the A. I. S. of the corps. They form the bulletin of the A. I. S. of the army. This bulletin is distributed to the artillery down to and including the batallion commanders, and, if possible, the battery

[1] There is usually reason to suppose that these batteries are barrage batteries, and it is especially important to take them under fire during an attack.

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commanders. The distribution is effected through the A. I. S. of the corps, which adds, if necessary, an explanatory note to the bulletin to indicate the changes reported by the army in the position or targets of certain enemy batteries.

Finally, the special study undertaken by the A. I. S. of the army, in collaboration with the second bureau, enables it to correct and complete the information obtained by the corps in regard to certain special targets (cantonments, bridges, munition depots, stations, etc.) that should be the object of special action by the artillery of the corps or the batallions of heavy artillery of the army. The result of these studies should be sent to the different units concerned in the form of information bulletins or special sketches made and distributed under the orders of the general commanding the army artillery.

Collaboration of the A. I. S. of the army with the different bureaus or services of the staff for the coordination of the information relating to the disposition of artillery.

The coordination of the information bulletins of the A. I. S. of the corps, and other information obtained by the staff of the army relating to artillery targets, is effected by the A. I. S. of the army in collaboration with the second bureau, the aeronautical service, and the range triangulation group as follows:

Second bureau.—The second bureau communicates the information received from prisoners relating to the enemy's batteries. It studies the aerial photographs, especially with a view of locating batteries, railroads, cantonments, tracks, and, in general, all distant objectives.

Aeronautical service.—The aeronautical service furnishes the A. I. S. of the army all information obtained by the army air squadrons. It collects all information which will aid it in taking photographs. The information obtained by the corps air squadrons, having been given to the A. I. S. of the corps and studied and discussed by them, no longer affects the squadrons directly.

Range triangulation.—The range triangulation group indicates the exact location on the battle map of the batteries located by the photographs and fixes their exact hectometric coordinates. If necessary, it verifies the positions sighted by the artillery observation section, and supplies the A. I. S. with the necessary data to enable it to carry out its study with the desired accuracy. It prints the bulletins of the A. I. S. and special maps made under its supervision.

The chief of staff of the army gives instructions for the collaboration of the above-mentioned offices and services with the A. I. S.

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Chapter IV.

OPERATION OF THE ARMY INTELLIGENCE SERVICE DURING BATTLE.

The mission of the A. I. S. in battle is identical with that assigned to it during periods of inactivity. The intensity of the action, the extent of the front of attack, and especially the rapidity of advance during an offensive render its work more delicate. It is necessary that the commanding officers of the A. I. S. make a special study of this service. Their work at this time is of the greatest importance. The effective use of the artillery depends directly upon them.

No fixed rules can be made for the work of the A. I. S. during combat. Their work will depend entirely upon the nature of operations taking place. Therefore the following instructions are not binding. They only form a general guide for the commanders of the A. I. S., who should, above all, take everything into consideration in executing their mission.

ARTILLERY INTELLIGENCE SERVICE OF THE CORPS.

(*a*) *Terrestrial observation information service.*—It is most important that terrestrial observations be carried on without interruption during a battle.

During periods of immobility the efficient operation of this service requires that it should be maintained within limits fixed by the army. The A. I. S. uses the artillery observation sections within their sector, but without modifying the positions of their observation stations and centrals. This restriction does not apply during operations which require sudden changes of front, and which render useless certain parts of the original observation system of the army. Therefore, during battle it is necessary to give the A. I. S. of the corps complete control of the terrestrial observation service in the corps section.

To prepare for their utilization in the advance, the commander of the A. I. S. first studies all the terrain in front of the line of observing stations occupied by the sections. He selects the sites for the new stations to be established after a quick advance. He gives instructions as to the steps to be taken by each section to enable the successive displacements of its stations and to establish the new system of telephonic communication. He requisitions from the army the supplementary transportation and matériel necessary to enable the sections to take up their new stations.

As soon as operations begin, he takes complete control of the sections. The displacement of the stations is carried out under his

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orders, at what appears to be the most opportune moment; it is carried out by echelons, and in such a way that the service is not interfered with for a moment. He also undertakes to maintain liaisons with the sections of the adjoining corps. If the advance is rapid, it is impossible to establish normal telephone liaisons between the observation stations of the section in time to be of use. It will then be necessary to maintain the service temporarily with visual liaisons, or even to use the stations occupied by the personnel of the sections as isolated stations, the coordination of their observations being obtained only by aid of a chronometer.

Finally, during actual movement, the A. I. S. employs the personnel of the sections as small groups of observers, ordered to effect various reconnaissances of which they are capable. For instance, the cadre of the sections may be employed to make panoramic sketches of certain interesting points of terrain, to ascertain the visible and invisible zones from these points, to cooperate in the adjustment and control of fire by combined lateral observations, or they may be put under the orders of an artillery battalion which is able to use them for similar missions.

When the A. I. S. of the corps has no artillery observation sections under its orders which can function under the above-mentioned conditions, these sections must be organized as in periods of inactivity, either by selecting the personnel from the artillery of the corps or by utilizing the observing detachments of the artillery divisions, the corps, or the heavy artillery.

The sound locating sections pass under the orders of the A. I. S. of the army corps under the same conditions as the terrestrial observation service. Whenever location by sound is no longer possible, the personnel of these sections is utilized by the terrestrial observation service.

(*b*) *Information service.*—During battle, when atmospheric conditions are favorable, most of the important artillery information comes to the aviation landing site of the corps. It is there that the photographs are received. It is there that the aviators make their reports after their return from flights. Direct contact with the observers who have made the photographs, studied the terrain, and carried out the reconnaissances, is of the highest importance to the A. I. S. It is therefore important that the commander of the A. I. S. send his adjutant to the aero squadron to examine the photographs as quickly as they are developed, to hear the reports of the observers, to ask further information, and, if necessary, to confer with them. This officer, who is in constant liaison with the information officer

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of the aeronautical service, immediately informs the commander of the A. I. S. of anything that may be of interest. And inversely, according to the instructions he receives, he gives the aeronautical service any data that may be of use to it or which may guide the observers in planning and carrying out their reconnaissances. Similarly, when the second bureau and the corps Topographical Section have sent representatives to the landing site, the representative of the A. I. S. keeps in close liaison with them.

The post of the commander of the A. I. S. is usually near the artillery commander of the corps. But if the command post of the heavy artillery of the corps is separate from that of the commander of artillery, the commander of the A. I. S. must go there periodically; or, still better, keep there representatives (chosen from one of his adjutants) to collect and handle information received directly by the aerials of the subordinate groups of heavy artillery.

Information collected, digested, and brought up to date by the A. I. S. is usually transmitted to the units by daily bulletins. In addition to the bulletins, the A. I. S. sometimes sends out during battle information concerning all or a part of the artillery of the corps. This information is sent without delay by telephone, messenger, or runner.

ARTILLERY INTELLIGENCE SERVICE OF THE ARMY.

(*a*) *Organization of terrestrial observation service.*—As indicated above, the A. I. S. of the army does not directly intervene in the work of terrestrial observations on the front of the army during battle. Each corps A. I. S. exercises complete control of the service in its sector. The A. I. S. of the army, however, keeps himself fully informed of all the dispositions made by the A. I. S. of the corps and of their needs, so that he can give them the necessary supplementary matériel and personnel. He must be ready at all times to organize a new system of observation along the front, whenever it appears to be necessary.

(*b*) *Information service.*—During battle the A. I. S. of the army digests as quickly as possible all information sent in by the A. I. S. of the corps. The result is sent to the corps in the usual way. It may be sent piecemeal if necessary to gain time. It is particularly important for the A. I. S. to send the army artillery commander a daily map showing the situation of the enemy artillery and the latest changes discovered in the number and situation of these batteries.

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Whenever operations succeed each other rapidly and it is important to inform the commander of the army of the disposition of the enemy's artillery on a certain part of the front, the commander of the A. I. S. of the army goes to the A. I. S. of the corps concerned and procures this information directly.

G. Q. G. 20 October, 1916.

J. JOFFRE.

APPENDIX I.

CORPS ARTILLERY INFORMATION SERVICE EQUIPMENT OF TOPOGRAPHICAL AND OBSERVATION MATÉRIEL.

This matériel is furnished by the Geographical service of the army.

TOPOGRAPHICAL MATÉRIEL.

Plane table 50 by 50, with stand	1
Adelade	1
"Great Eagle" board	2
Board 70 by 70 (optional)	1
Aiming circles, with tripods	4
Grooved leveling alidades (with radio-actif wire)	4
Celluloid protractors (1,000th)	2
Zinc protractors (degrees)	1
Zinc protractors (1,000th)	1
Graduated rulers (zinc or wood)	3
Graduated squares	2
Chronometers	5
Field glass supports	4

OPTICAL INSTRUMENTS.

Prismatic monoculars (or binoculars), type X, 1916, field model.	4
Field glasses, 3 X, with accessories, for night observation	4
Prismatic field glasses, with micrometer	4
Lamp indicator, like that used by the terrestrial observation service centrals, may be issued if necessary	1

DRAWING MATÉRIEL AND OFFICE ACCESSORIES.

Clyclostyle (manifold)	1
Compass case	1
Bean compass (trammel)	1
Double decimeter	2
Squares (45° and 60°)	2

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Appendix II.

REMARKS ON THE VALUE OF INFORMATION RELATING TO ARTILLERY TARGETS.

In his study of the subject, the commander of the A. I. S. should consider information which has been given him or which he himself has obtained through the observers, and also the difficulties the observers overcame in acquiring this information. The value of information depends greatly upon the source and the way it was acquired. As a rule the following remarks should be kept in mind while considering it:

COMPARATIVE VALUE OF VARIOUS INFORMATION.

(*a*) *Information of the second bureau.*— Information from the second bureau is very interesting and valuable to the A. I. S., because, as a rule, it is absolutely impossible to procure it in any other way. But in using it the A. I. S. should consider the importance attributed to it by the second bureau. Information furnished by prisoners on the approaches habitually used by reliefs and supply detachments, and on shelters and cantonments, can usually be checked by examining the topography of the enemy zone and the general organization of his defenses as shown on the battle map. Information relating to false batteries, or batteries hidden in dwellings or orchards or disguised by camouflage of any kind, can not be relied upon unless confirmed by several witnesses. They may verify the existence of the battery, but are seldom able to give exact information as to its position. The results of our own artillery fire on targets to be destroyed can usually be obtained with a good deal of accuracy from the testimony of prisoners. Sketches and documents found on the enemy give information whose value varies according to the form in which it is presented.

(*b*) *Information and documents supplied by the aeronautical service.*— The targets found by aerial photographs are determined with precision if they are near reference points (roads, woods, etc.) shown on the map. A map that is not strictly up to date (a new front or a region not accurately mapped) may lead to errors in photographic reproduction. The similarity of the photographs and of the map is not a certain indication of the value of the latter, since errors may have been made in the location of the area.

In the case of batteries, the photographs show only the sites. The emplacement seen may, or may not, be occupied, or there may be false batteries kept up with care to imitate those that are occupied

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(approaches, blasts of guns, etc.). However, during periods of great activity, and when obliged to reinforce rapidly his artillery under fire, the enemy can not, as a rule, organize false batteries, and he takes, moreover, fewer precautions to camouflage his positions, so that the information furnished by the photographs is more accurate.

The sites of batteries discovered by flying observers can not be considered exact unless they are situated near some distinguishing point of the terrain accurately located on the map (road, border of wood, etc.), or unless their exact location can be shown on the photographs by the observer.

The batteries observed by balloon can only be accurately located in the sense of the directions in which the observer saw them, except in clear weather and when the terrain presents definite reference points which enable errors due to the distance of the targets to be corrected.

(*c*) *Information furnished by the terrestrial observation service.*—Terrestrial observation can only locate batteries and other distant targets by the intersection of sights taken from several stations. Three sights, intersecting at sufficiently large angles at a single point, are necessary for exact location.

With the instruments actually in use, determination of positions from the gun flashes at night is less accurate than locations made by day. The use of devices to hide the gun flashes and the production of false flashes increase the difficulty of locating by flash, and cause mistakes which should be guarded against.

Locations made by isolated observation stations should be accepted only as an indication—more or less precise—of the direction of the targets. When the stations lack direct liaison permitting adjustment of watches, the greatest care should be exercised in combining the sights of several observing stations by simultaneous observations.

Locating by sound is very delicate and generally very slow, but it is capable of giving accurate results within 50 to 100 meters, as a rule, when automatic registering instruments are used. Its precision diminishes as the range to the battery or its obliquity to the general base of the sections increases. Wind also interferes with it. The information thus obtained has the advantage of giving absolute proof that the positions observed are occupied and often indicates the caliber of the guns located.

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Appendix III.

DAILY BULLETIN.

List of enemy batteries disclosed in action, and recognized sites.

Region.	Designation hecto-mectric coordinates.	Exact ordinates. X	Exact ordinates. Y	Situation of the battery.	Hour.	Firing on.	Caliber.	Source of information.	Observations.
(a)	(b)	(c)		(d)	.....	.....	.....	(e)	(f)

a Indication of the region having a recognized name. Classify all batteries found in the same zone under the same region.

b Underline new batteries.

c This column not to be filled in unless the position of the battery can be exactly determined by photographs or accurate intersection.

d Indicate whether it concerns—

A site that appears to be unoccupied.

A site that appears to be occupied.

A battery seen in action.

e Observers in aircraft or balloons—Terrestrial observations—Locating by sound—Aerial photographs, etc.

f In case the coordinates approach the coordinates of a battery already shown indicate whether they apply to this battery in place of the preceding ones, or if they concern an entirely new battery.

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PART II.

CHAPTER 1.

GENERAL DISPOSITION.

The terrestrial observation intelligence sections (T. O. I. S.), previously called flash locating sections, have the following duties:

1. To maintain a general supervision over the enemy's zone, especially in remote regions not under the supervision of the infantry, and to note all movements, works, or operations of the enemy in that zone.

2. To locate by process of intersection these enemy batteries whose whereabouts may be disclosed by smoke or flashes, and to identify batteries previously located as they open fire.

3. To observe the effect on special targets of our own fire for adjustment or for effect.

The T. O. I. S. are part of the army artillery. The army artillery studies and decides upon their positions. They are put under the orders of the corps in whose sector they operate.

The army geographical service furnishes them with the necessary technical matériel. The director general of the geographical service exercises the technical direction over the sections with the armies.

CHAPTER 2

ORGANIZATION OF SECTIONS.

(A) PERSONNEL.

1 officer commanding the section.
1 additional officer or noncommissioned officer.
8 sergeants, corporals, and assistant chiefs of stations.
26 observers (2 are supplementary).
5 telephone operators and electricians (of which one is a corporal in charge).
4 draftsmen.
2 bicyclists.
2 cooks.

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This personnel is sufficient to carry on the work of four posts. Eight observers (including the chief and assistant chief of station) are assigned to each post and provide for continuous observation by relays of two men at a time.

The telephone operators and electricians are responsible for minor repairs to their wires and instruments. They operate the registering apparatus if such an instrument is provided.

As a rule the sections are organized within each army from personnel provided by the artillery, but if necessary the personnel may be partially drawn from the units of territorial infantry.

If, in an exceptional case, an infantry, cavalry, or engineer officer should be placed in command of a section in an army, he exercises this command while remaining in his original arm of the service.

(B) MATÉRIEL FOR OBSERVING AND DRAFTING.

8 aiming circles with support for field glasses.
8 prismatic field glasses with micrometers.
4 prismatic field telescopes (Type X, campaign model 1916).
4 binoculars for night use.
6 chronometers.
Drawing boards, drawing paper, compass, rulers, squares, protractors, etc.

This matériel is furnished by the geographical service of the army, and issued to the sections by the army range triangulation group.

The preceding allowance is for a section of four observation stations. It may be increased for sections with more observation stations and for sections operating on a very active front or whose stations cover a large area.

(C) SPECIAL TELEGRAPHIC MATÉRIEL.

This matériel, called TM, including the matériel for the observation stations, matériel for the centrals, and the line matériel needed to establish the interior liaisons of the section, but not other line matériel, is furnished and installed by the army geographical service.

(D) TELEPHONE MATÉRIEL.

The matériel needed to establish the liaisons of the sections with the artillery and the staff is furnished and installed by the first line telegraph service. The first line-telegraph service also furnishes the sections with the line testing apparatus.

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(E) TRANSPORT MATÉRIEL.

Each section is allowed one light truck and four bicycles. Any additional means of transportation necessary to guarantee the service or change position are supplied by the army.

CHAPTER 3.

INSTALLATION OF SECTIONS—TECHNICAL OPERATION.

(A) OBSERVATION STATIONS.

The observation stations of the T. O. I. S. are distinct from the various observation stations of the command and the fire-adjustment observation stations of the artillery.

Position of observation stations.—The observation stations of the sections should command extended views of the enemy's zone. The sites should be selected at a sufficient distance from the first line to permit the installation and upkeep of the telephone wires under all circumstances. Nevertheless, if the view is especially good, or if it allows for lateral sights giving good intersections on certain points, a station may be placed far in advance.

The observation stations of the same section should be so placed along the front that they, as a whole, may exercise as complete a surveillance as possible over the zones in which the enemy artillery may disclose itself through its flashes or smoke, and over the regions in which the movement of troops or transports may be observed. They are spaced sufficiently to allow fairly large angles of intersection.

The number of observation stations necessary to assure satisfactory service on a given length of front will depend on the terrain. However, four observing posts along a front of 10 kilometers will usually suffice. The location of observation stations, as well as the reference points, should be precisely determined by the range triangulation group.

Installation of observation stations.—Each observation station should be large enough to shelter four men, and permit the comfortable use of sighting instruments. This can not always be done, however, if chimneys, ladders, towers, or trees are used.

It must be sheltered from bombardment by heavy artillery of medium caliber (15 cm. and 21 cm.) in order that it may be used under any circumstances. If, in order to reduce the visibility of the station, it is necessary to forego such complete shelter, the

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station should be connected by a shaft or sap to an absolutely bomb-proof underground shelter whose means of access are carefully concealed from the enemy's view.

Each observation station must contain—

1. *Observing instruments:*
   2 field glasses with support and aiming circle.
   1 prismatic field telescope.
   1 binocular for night use.
   1 chronometer.
2. *TM matériel.*
   A telephone, with vibrator (buzzer) and headpiece, a box containing the batteries, a condenser, and a key (manipulator).
3. *Telephone matériel for exterior communications.*
4. *Survey supplies and equipment.*

A battle map, on a board, of the zone to be observed, showing the position of the observation station and reference points, and having a graduated scale so that the directions sighted may be read rapidly. It is also advantageous to show on this map those parts of the terrain hidden from the observation station.

Panoramic views (perspective sketches or photographs) giving by name, number, or letter all indications necessary for comparison with the terrain and the battle map. They should be graduated on either side of the reference point, giving the direction of all conspicuous points in such a way as to enable the azimuth to be taken at sight and by simple interpolation between two points.

Range cards, on which the observations taken are recorded in chronological order.

The orders of the observers should be posted in full view, and should state the duties of the station, the organization of the service, and any regulations to be observed by the personnel, etc.

Personnel of the observing stations.—The following observation detachment is assigned to each station: One sergeant, commanding the station; 1 corporal, second in command; 6 observers. The tours are arranged so as to have not less than two observers always on duty, with two others resting nearby ready to relieve them. During periods of great activity, three or four observers may be necessary at one time.

One of the observers uses the glasses and acts as the look-out. He wears the telephone headpiece, connecting him with the central and other observation stations. The other observer directs his telescope on the target indicated by the first observer or by other

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stations. He holds the TM key in his hand and ticks off the precise instant of his observation.

In order to perform their duties satisfactorily, it is important that the observers be very skilled in the use of their instruments. They should form the habit of verifying, both before and after each series of measurements, the position of the goniometer in relation to the reference point. Any difference should be noted and transmitted to the central. If the telescope for reading angles is out of order the field glasses with micrometer scales may be used to take the measurements based on the reference point. The observers must also be thoroughly familiar with the region under observation, as well as the enemy organizations. In observing by day, they must be very careful to state the approximate location as well as the direction of the reference points.

(B) CENTRAL STATION.

One central station assures the utilization of the information received from the various observation stations. The section commander or his adjutant personally directs the study and coordination of the information sent in by the observers.

The station is located either near or in rear of one of the observation stations of the section, and it is advantageous to place it near a command post of the artillery or of the A. I. S. on which it depends.

It is equipped with—

1. TM matériel for the central, including a switchboard equipped with 4 relays, adjustable resistance, and measuring instruments; a box of batteries; an alarm; a small box with 5 compartments each containing a lamp; a telephone with vibrator and headpiece.

2. Telephone switchboard forming the means of outside communication with the section.

3. Survey and drawing material consisting of—

A sheet of paper, cross-sectioned and mounted on a large board of zinc or wood for the graphic determination on a scale of $\frac{1}{20000}$ of the positions recorded by the observers. This cross-section paper shows the positions of the observation stations and has graduated arcs of large radius or graduations drawn on the edge of the board, permitting one to lay off with a ruler the direction given by the observation station. These graduations are drawn by the range triangulation group with all possible precision, aided by a certain number of calculated points.

A battle map on a board giving the same indications as the cross-section paper. This map is used by the section commander in

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directing observation. It permits him to inform the various observation stations in what direction they must look for some object described by one of the stations.

(c) TELEPHONE COMMUNICATIONS.

In addition to the telephone communication established within the section by the TM matériel, each observation station is connected with the command post or observation station of the commander of the nearest battalion of heavy artillery. This liaison provides the section with an emergency line to central through the artillery system.

The central of the section is connected by direct wires to the A. I. S. to which it is attached, and, if necessary, to the A. I. S. of neighboring corps and the centrals of adjoining sections. If convenient, it can be connected in the same way with certain battalions of artillery and with the command posts of divisions and corps. Liaison is assured with the air squadrons, balloons, and the army artillery by the general telephone system.

The efficiency of a section depends largely on the excellence of its telephone communications.

The section commander takes any steps necessary to insure the rapid repair of his telephone lines.

(d) USE—LOCATING—ADJUSTMENTS.

Locating.—Sections must discover and locate targets which present themselves under various conditions.

1. Fixed targets, such as various works forming part of the enemy lines, can be determined with great accuracy. The observation station which finds them indicates them to the others. They are given all the time necessary to study and agree upon the exact position of the target sighted. The measurements present no difficulty. They can be repeated as often as necessary to insure exactitude of the intersections.

2. Moving targets, such as detachments of enemy troops, convoys, and trains, should be located as quickly as possible. If their itinerary is marked on maps (paths, road, railroad tracks), it will help the observers to designate them to each other and to determine their speed, direction and position at a given moment. The operations of the different observation stations must be absolutely simultaneous, and must coincide exactly as to the points observed.

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3. Enemy batteries revealing themselves by gun flashes or smoke can be exactly located only by simultaneous sighting.[1] The TM matériel enables the simultaneous sightings of the various observation stations to be recognized. The arrangement consists of a series of electric lights at the central, each one connected with an observation station. At the exact instant of sighting the observer presses his key, which lights the lamp at the central.

Centrals and observing stations operate in the following manner: An observer locating a gun flash or smoke in a direction hitherto unsuspected, advises the central, giving the direction and approximate region of the flash. The officer or sergeant at central determines with the aid of the battle map the approximate direction in which the same series of flashes can be observed by the other stations. All then sight on any flashes visible in the direction given. Central follows the operations by watching the lamps, correcting and directing the stations until the lamps all light in perfect unison—showing that the observers are all sighting on the same gun flash. Central then gets by telephone from the observation stations the directions read on their goniometers. Even in case of absolute simultaneousness it will be necessary to measure several times the directions to be located.

Under favorable conditions, this method of locating an enemy battery is as accurate, if not more so, than any other, and the different guns of the same battery can be located in their respective positions.

The location of a new battery is easily accomplished by day. At night it may take longer, owing to the difficulty of orienting the observers. It will also be less accurate, owing to the fact that night binoculars are substituted for field telescopes.

The locating of batteries already recognized and again entering into action, is usually rapid. If two stations sighting a gun flash find their measurements correspond to those previously made in locating the battery (or corresponding to the position obtained by another method and marked on the battle map), the identification of the battery firing is complete.

Adjustments.—Sections may be used to observe our own artillery in fire for adjustment or for effect. The operations are limited, as

[1] This supposes that the sights correspond accurately with the same flashes and gun positions of the enemy. The process, which consists of observing flashes from isolated stations and then coordinating their directions by aid of the times noted by the observers, is an improvised process which is both laborious and uncertain.

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far as the observers are concerned, to signaling the exact direction of the point of impact. Central indicates the zone to be observed. It is advantageous to observe each series of rounds fired consecutively, and without interruption. The measurements corresponding to sights taken by the observers are sent to central, either shot by shot or after the sighting is over.

Central makes the calculations necessary to adjust the deflection and range and sends the results to the unit concerned. (The technical instructions distributed to the sections give all the information needed to make these calculations.) Central may sometimes merely transmit the observations made, together with any indications necessary for the precise adjustment of the fire, to the batteries concerned—e. g., deflection measured at the observation station between the burst and a particular point of the target or a point chosen as auxiliary target. These indications can be furnished very quickly if a sketch is made by the battery showing the target and range on a large scale.

Observations can be made at night under the same conditions.

Chapter 4.

USE OF SECTIONS—SUPERVISION—LOCATING—ADJUSTMENTS.

Each T. O. I. S. occupies a position on the front chosen and assigned by the army artillery, but in all that concerns its duties it reports only to the A. I. S. of the A. C., to which it is attached. It is the duty of the A. I. S. to define precisely the mission of the section, to arrange for the transmission of its information, to define the nature of it's liaison with the different battalions of artillery and with the staffs or other agencies of the corps. Under certain circumstances the A. I. S. will direct its attention to the more important zones, and will facilitate observation by furnishing it with any information received from other sources. It also informs the sections of projected operations in their own or neighboring sectors, in order to prepare them to observe those regions in which enemy targets might be revealed.

As a rule, all information which can be utilized immediately should be sent with the least possible delay to the unit designated, or the unit qualified to follow it up. Eventually this information must be sent to the authority whose duty it is to decide upon the manner in which the information shall be utilized. But in any case the A. I. S. should receive as soon as possible all information transmitted by the section directly to the units or staffs.

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The section commander draws up a daily bulletin, issued at an hour fixed by the A. I. S. and distributed within the army corps according to instructions. Two copies of this bulletin are sent to the army (artillery and range triangulation).

Participation in adjustment and control of fire is only required of a section under conditions which prevent adequate aerial observation or if the regular fire-control system of observation is out of order. Its participation is especially useful in the case of targets discovered and located by the section itself, the case of targets (or auxiliary aiming points) for long-range guns, and the case of night fire which requires adjustment by the aid of several stations.

The commander of the A. I. S. regulates the manner in which the adjustment should be made by the section, according to instructions received from the commander of artillery, and facilitates its rapid execution.

Chapter 5.

USE OF SECTIONS DURING COMBAT AND IN THE ADVANCE.

During combat and in the advance the T. O. I. S. are attached to the A. I. S. of the A. C. They are used as long as possible under the usual conditions existing during the period of inactivity. They change stations by echelon, and maintain their liaisons by the best means they can improvise. During actual advance, and immediately afterwards, while waiting until their operations as sections may be resumed they are, for the time being, broken up into groups of observers under the orders of smaller groups of artillery, or else are used for reconnaissance and observation under the artillery commander (see Instructions on the Artillery Information Service, Chap. V).

Chapter 6.

ADMINISTRATION.

The T. O. I. S. are attached, through general headquarters, to an artillery depot, and each class receives a serial number. The section is not an independent administrative unit. It is supplied by adjoining units.

S. Q. G., October 20, 1916.

J. Joffre.

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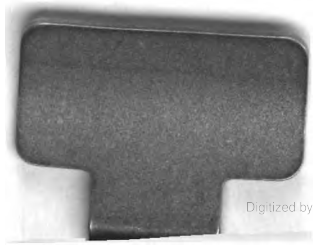

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